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14. ABSTRACT

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CP

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO) 12 Sep 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2001-187**
Mario Fajardo et al., "Aluminum Doped Parahydrogen Solids" (Abstract only)

HEDM Conference **(Statement A)**
(Mtg. Location/Date: TBD) **(Deadline: ASAP)**

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PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

abstract.pdf

HIGH ENERGY DENSITY MATTER CONTRACTORS CONFERENCE
Park City, UT 24-26 October 2000 – Pls change this info when you receive it

Aluminum Doped Parahydrogen Solids

Not approved last year?

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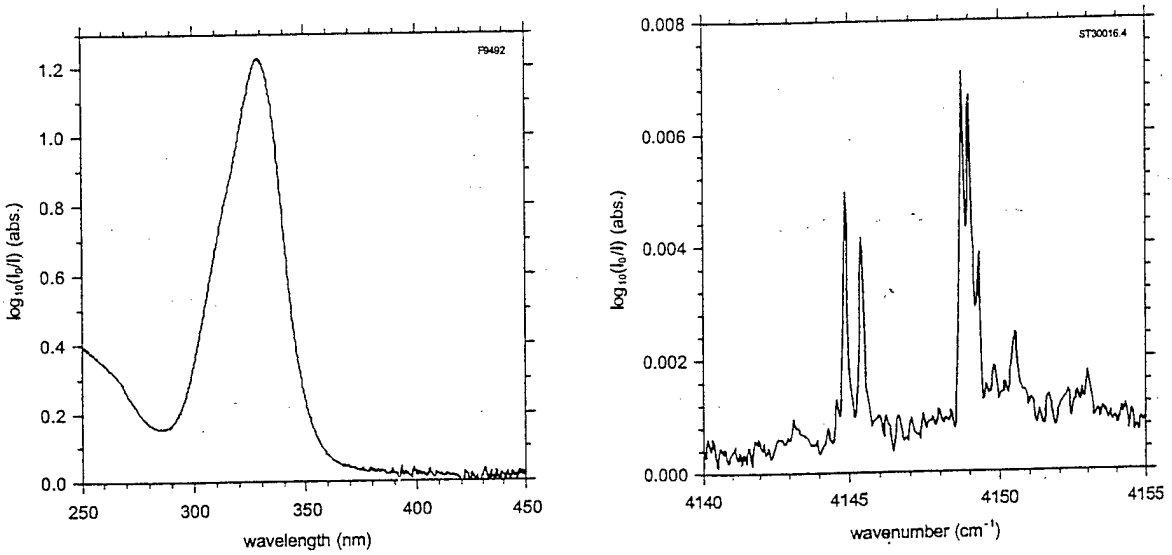
During the past year we focused our efforts towards the production and characterization of gram-scale cryogenic parahydrogen (pH_2) solids doped with large (~ 1 %) concentrations of Al atoms. We incorporated into our apparatus a commercially available effusive Al atom source capable of delivering Al atom fluxes in excess of 10^{17} #/cm^2-s to the sample deposition substrate, enabling the deposition of heavily-doped millimeters-thick samples on a ~ 1 hour timescale. – Pls use "ca" for "an approximate 1 hour"

Determination of the trapped Al atom concentrations from the measured ultraviolet (UV) atomic absorption spectra is problematic in such large column density (concentration x pathlength) samples, due to limitations on the dynamic range and signal-to-noise ratio achievable in absorption measurements. Fortunately, we can exploit the weak infrared (IR) activity induced by the Al atom dopants in neighboring pH_2 molecules as a diagnostic of the atomic concentrations. The left panel of the figure shows the UV absorption spectrum of a 1.4 mm-thick pH_2 solid containing ≈ 20 ppm Al atoms; the right panel shows the corresponding Al atom induced IR absorption.



Our initial attempts to produce millimeters-thick samples containing Al atom concentrations in excess of ~ 500 ppm have resulted in the apparent recombination and/or reaction of most of the Al atoms. We conjecture that when the pH_2 solid reaches a critical combination of Al concentration and sample thickness, the energy released upon occasional atomic recombination is no longer dissipated effectively, resulting in increased local temperatures and atomic mobilities, and ultimately leading to a recombination cascade which propagates throughout the sample. Our efforts to achieve higher Al atom concentrations in thinner samples are ongoing; we will report our progress at the conference.

STINFO suggests adding distribution statement to footer

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